

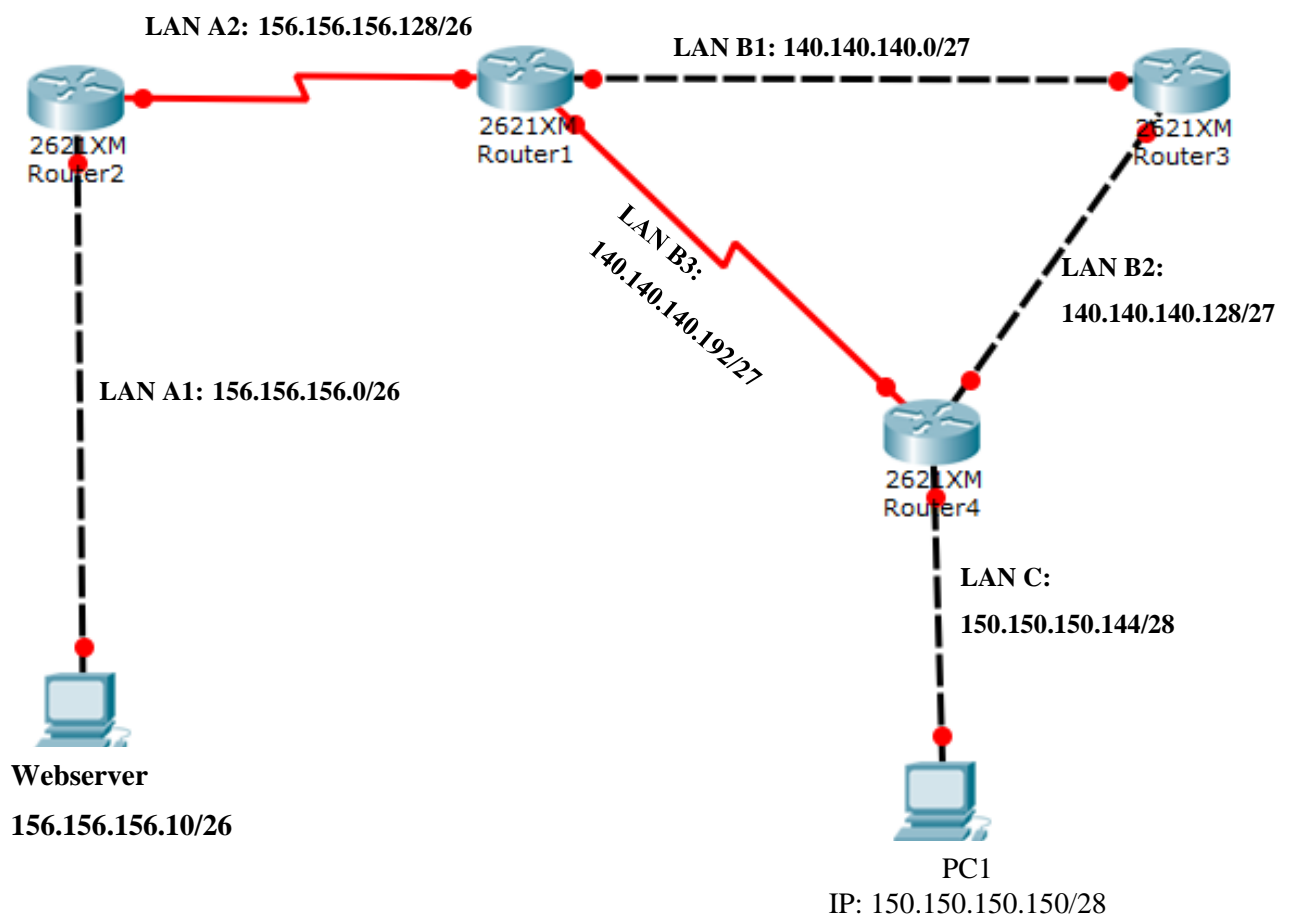
Name: Trương Đăng Trúc Lâm

ID: B2111933

Group: M04

Construct a network system as follows:

- LAN A has a single network address of 156.156.156.0/24, using static routing. LAN A is divided into 2 subnets, consisting of A1 and A2. In addition, there is a Web server running a simple webpage showing “YEAH! My name is *YOUR_FULL_NAME*” (replace *YOUR_FULL_NAME* by your full name) in LAN A1.
- LAN B1 has a network address of 140.140.140.0/27, using the RIPv2 protocol.
- LAN B2 has a network address of 140.140.140.128/27, using the RIPv2 protocol.
- LAN B3 has a network address of 140.140.140.192/27, using the RIPv2 protocol.
- LAN C includes PC1 and Router 4. The IP address of PC1 is 150.150.150.150/28.



Please take screenshots showing:

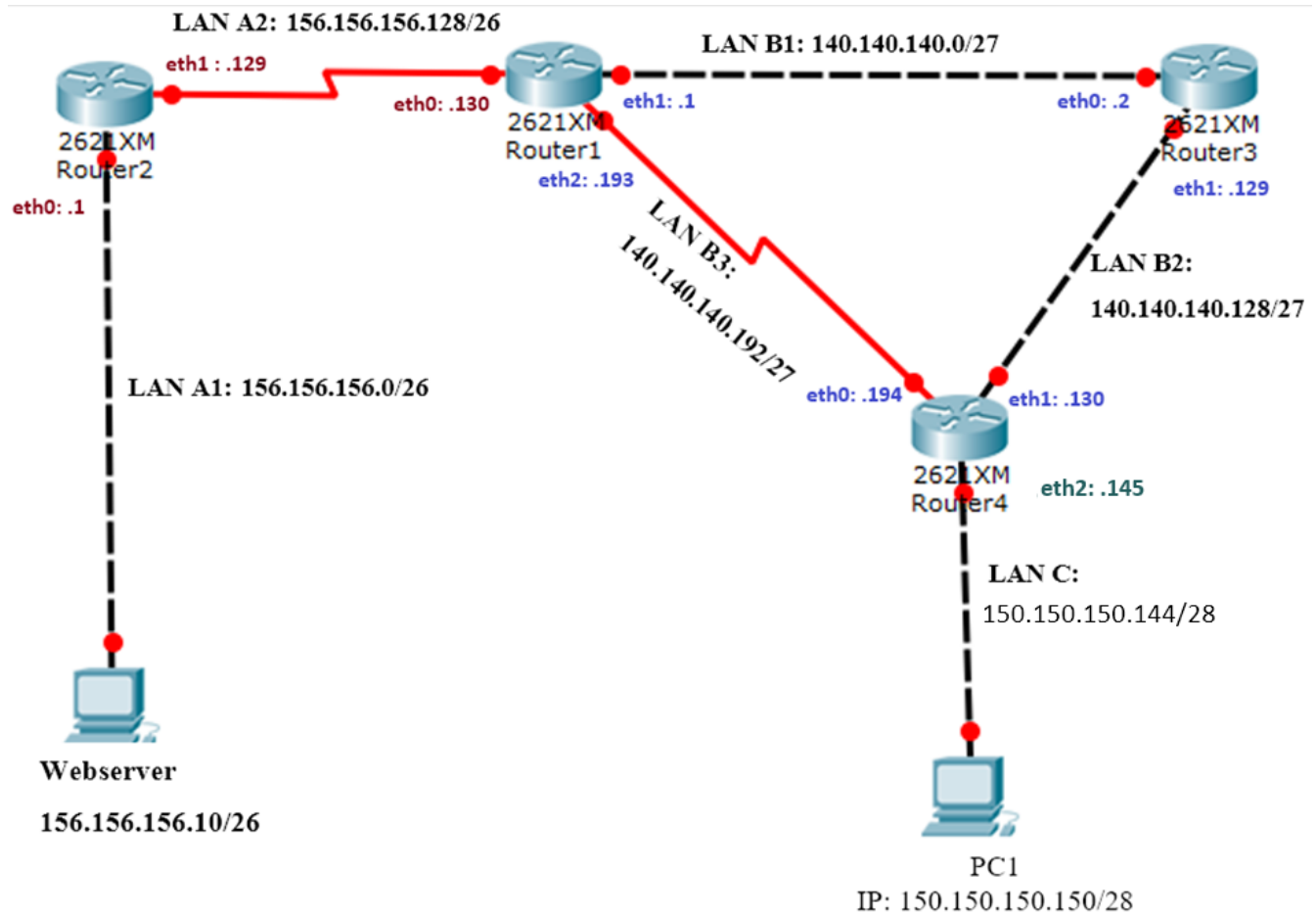
1. (0,5 point) select and assign the IP addresses for all of the Ethernet interfaces.
2. (1,0 point) the directory tree structure of this network system (using the *tree* command).
3. (1,0 point) the content of the file *lab.conf*?
4. (5,0 points) the content of all files *. *startup*
5. (1,0 point) the contents of all files and commands you use in order to set up the web service on the web server
6. (0,5 point) the command line to check the hops for transmitting data from PC1 to the web server? List all hops between PC1 and the Web server.
7. (1,0 points) check the network system constructed (using the *ping* command).

*****GOOD LUCK*****

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1. Select and assign the IP addresses for all of the Ethernet interfaces.



2. The directory tree structure of this network system

UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal

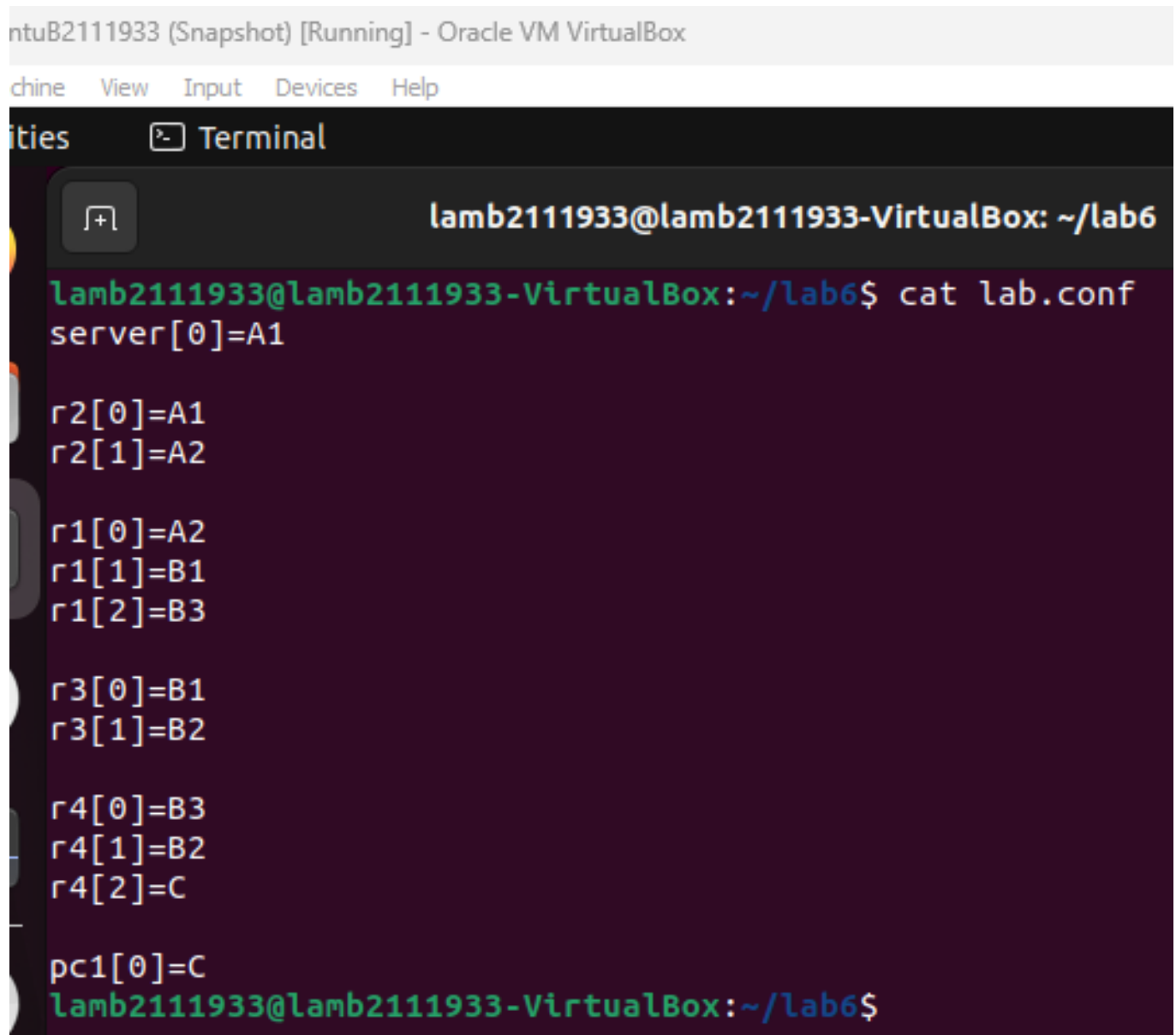
lamb2111933@lamb2111933-VirtualBox: ~/lab6

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ tree
.
├── lab.conf
├── pc1
├── pc1.startup
├── r1
│   └── etc
│       └── quagga
│           ├── daemons
│           ├── ripd.conf
│           └── zebra.conf
├── r1.startup
├── r2
├── r2.startup
├── r3
│   └── etc
│       └── quagga
│           ├── daemons
│           ├── ripd.conf
│           └── zebra.conf
├── r3.startup
├── r4
│   └── etc
│       └── quagga
│           ├── daemons
│           ├── ripd.conf
│           └── zebra.conf
├── r4.startup
├── server
│   └── var
│       └── www
│           └── html
│               └── index.html
├── server.startup
└── shared
```

16 directories, 17 files

lamb2111933@lamb2111933-VirtualBox:~/lab6\$

3. the content of the file *lab.conf*



The screenshot shows a terminal window titled "ntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox". The terminal has a menu bar with "Machine", "View", "Input", "Devices", and "Help". Below the menu bar, there is a tab labeled "Terminal". The terminal prompt is "lamb2111933@lamb2111933-VirtualBox: ~/lab6". The user has entered the command "cat lab.conf", and the output is displayed as follows:

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat lab.conf
server[0]=A1

r2[0]=A1
r2[1]=A2

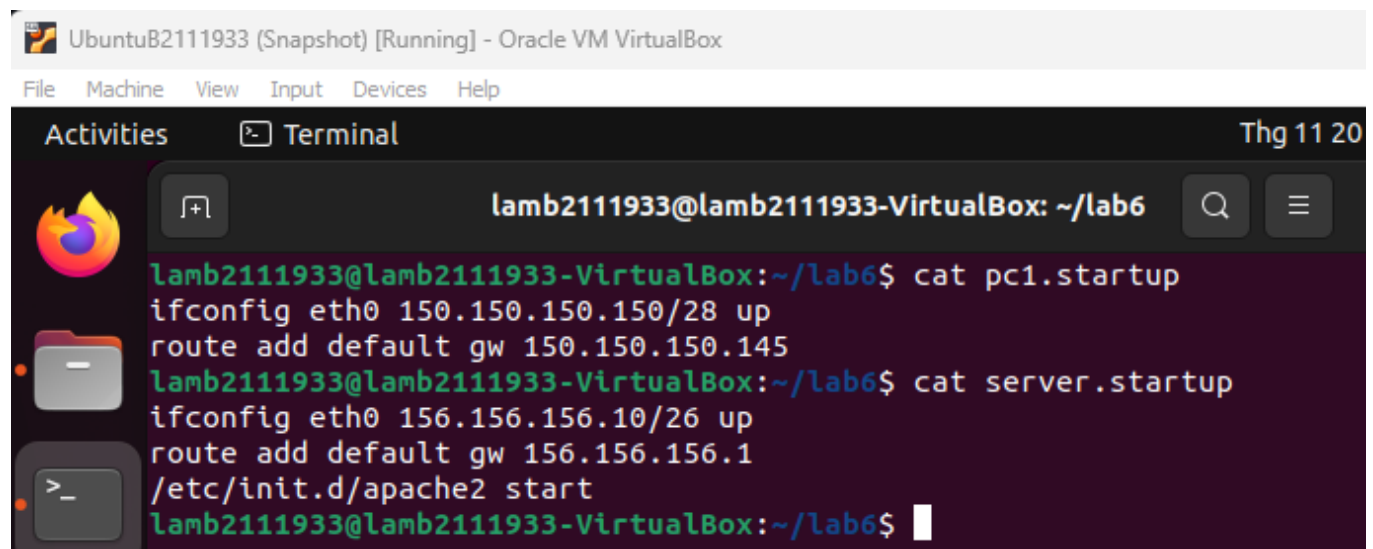
r1[0]=A2
r1[1]=B1
r1[2]=B3

r3[0]=B1
r3[1]=B2

r4[0]=B3
r4[1]=B2
r4[2]=C

pc1[0]=C
lamb2111933@lamb2111933-VirtualBox:~/lab6$
```

4. the content of all files *.startup



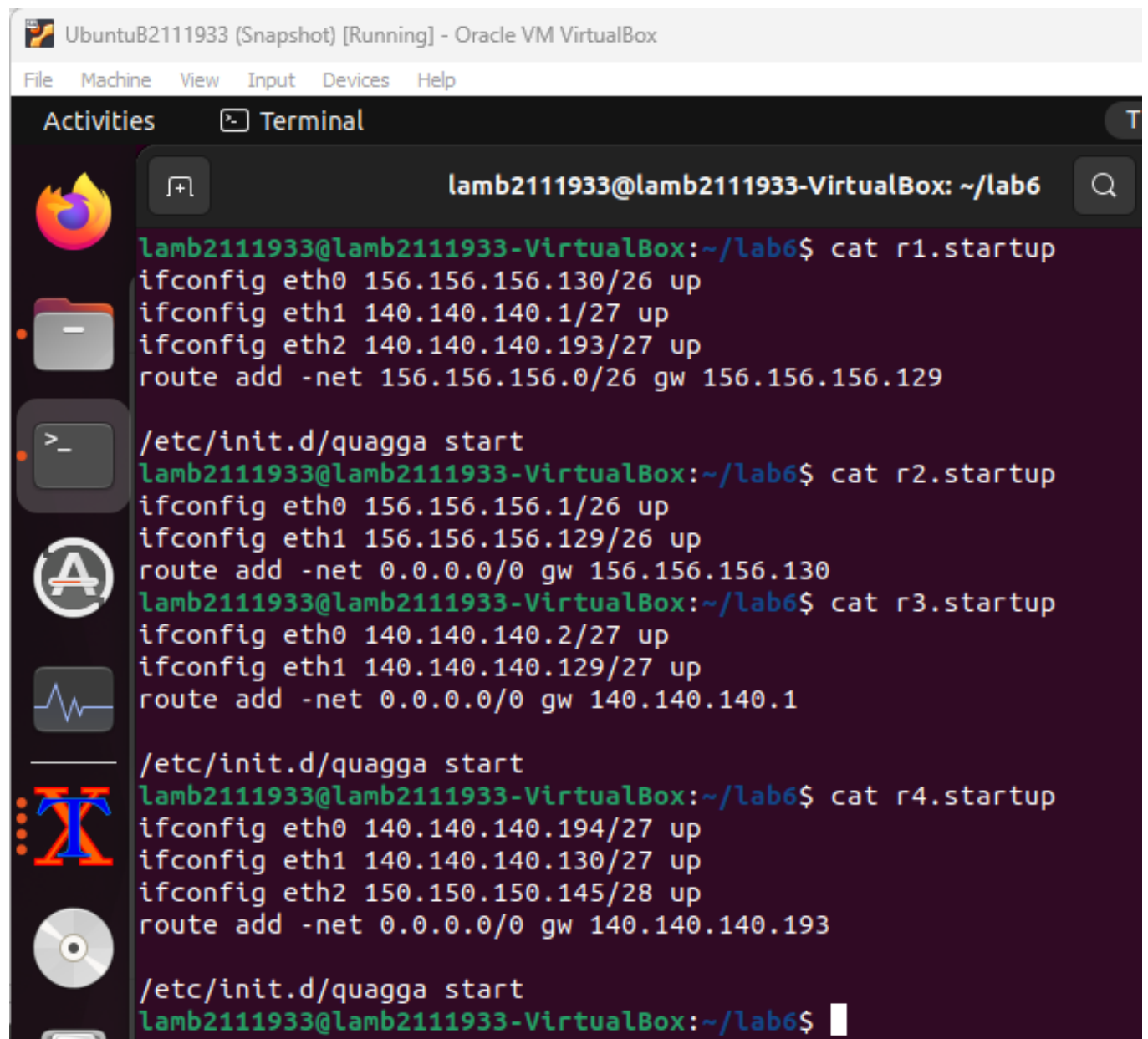
UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal Thg 11 20

lamb2111933@lamb2111933-VirtualBox: ~/lab6

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat pc1.startup
ifconfig eth0 150.150.150.150/28 up
route add default gw 150.150.150.145
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat server.startup
ifconfig eth0 156.156.156.10/26 up
route add default gw 156.156.156.1
/etc/init.d/apache2 start
lamb2111933@lamb2111933-VirtualBox:~/lab6$
```



UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal T

lamb2111933@lamb2111933-VirtualBox: ~/lab6

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat r1.startup
ifconfig eth0 156.156.156.130/26 up
ifconfig eth1 140.140.140.1/27 up
ifconfig eth2 140.140.140.193/27 up
route add -net 156.156.156.0/26 gw 156.156.156.129

/etc/init.d/quagga start
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat r2.startup
ifconfig eth0 156.156.156.1/26 up
ifconfig eth1 156.156.156.129/26 up
route add -net 0.0.0.0/0 gw 156.156.156.130
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat r3.startup
ifconfig eth0 140.140.140.2/27 up
ifconfig eth1 140.140.140.129/27 up
route add -net 0.0.0.0/0 gw 140.140.140.1

/etc/init.d/quagga start
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat r4.startup
ifconfig eth0 140.140.140.194/27 up
ifconfig eth1 140.140.140.130/27 up
ifconfig eth2 150.150.150.145/28 up
route add -net 0.0.0.0/0 gw 140.140.140.193

/etc/init.d/quagga start
lamb2111933@lamb2111933-VirtualBox:~/lab6$
```

*RIPv2 configuration

tuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

hine View Input Devices Help

ies Terminal

Thg 11 20 19:4

lamb2111933@lamb2111933-VirtualBox: ~/lab6

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat r1/etc/quagga/daemons
```

```
zebra=yes  
bgpd=no  
ospfd=no  
ospfd6d=no  
ripd=yes  
ripngd=no
```

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat r1/etc/quagga/ripd.conf
```

```
hostname ripd  
password zebra  
enable password zebra  
  
router rip  
redistribute connected  
network 140.140.140.0/24
```

```
log file /var/log/quagga/ripd.log
```

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat r1/etc/quagga/zebra.conf
```

```
hostname r1  
password zebra  
enable password zebra
```

```
log file /var/log/quagga/zebra.log
```

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat r3/etc/quagga/zebra.conf
```

```
hostname r2  
password zebra  
enable password zebra
```

```
log file /var/log/quagga/zebra.log
```

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat r4/etc/quagga/zebra.conf
```

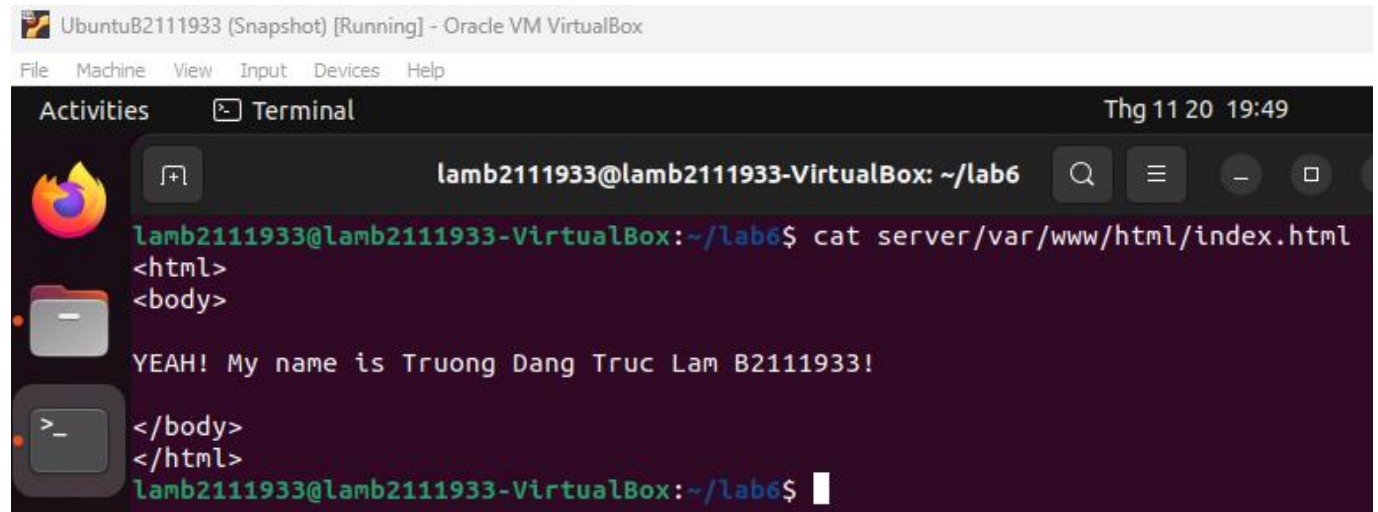
```
hostname r3  
password zebra  
enable password zebra
```

```
log file /var/log/quagga/zebra.log
```

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$
```

5. The contents of all files and commands you use in order to set up the web service on the web server

The contents of file **index.html**:



UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

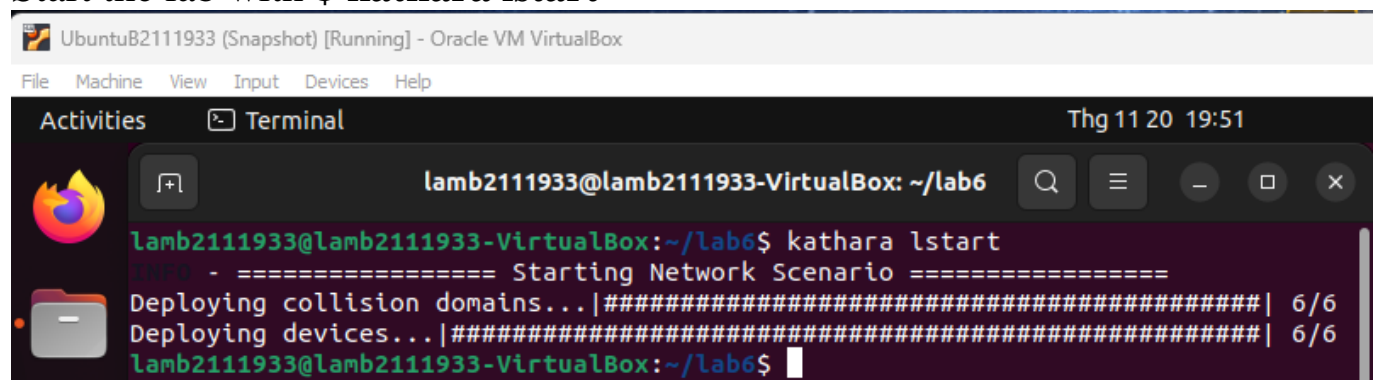
File Machine View Input Devices Help

Activities Terminal Thg 11 20 19:49

lamb2111933@lamb2111933-VirtualBox: ~/lab6

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ cat server/var/www/html/index.html
<html>
<body>
YEAH! My name is Truong Dang Truc Lam B2111933!
</body>
</html>
lamb2111933@lamb2111933-VirtualBox:~/lab6$
```

Start the lab with \$ **kathara lstart**



UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

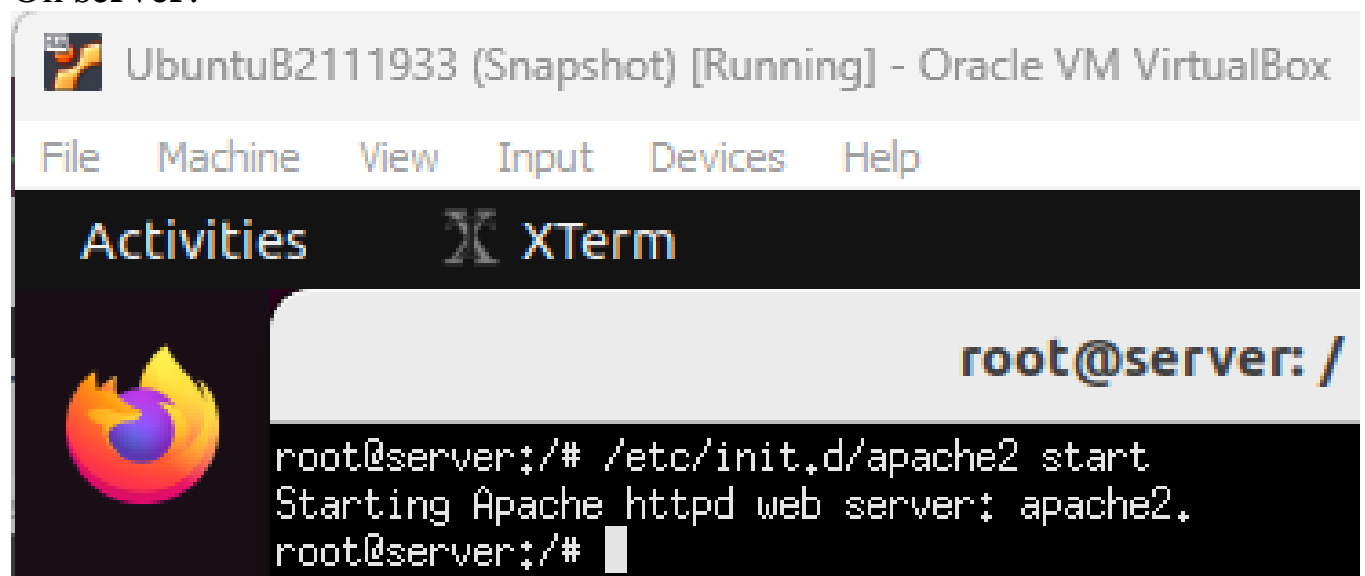
File Machine View Input Devices Help

Activities Terminal Thg 11 20 19:51

lamb2111933@lamb2111933-VirtualBox: ~/lab6

```
lamb2111933@lamb2111933-VirtualBox:~/lab6$ kathara lstart
INFO - ===== Starting Network Scenario =====
Deploying collision domains...|#####| 6/6
Deploying devices...|#####| 6/6
lamb2111933@lamb2111933-VirtualBox:~/lab6$
```

On server:



UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

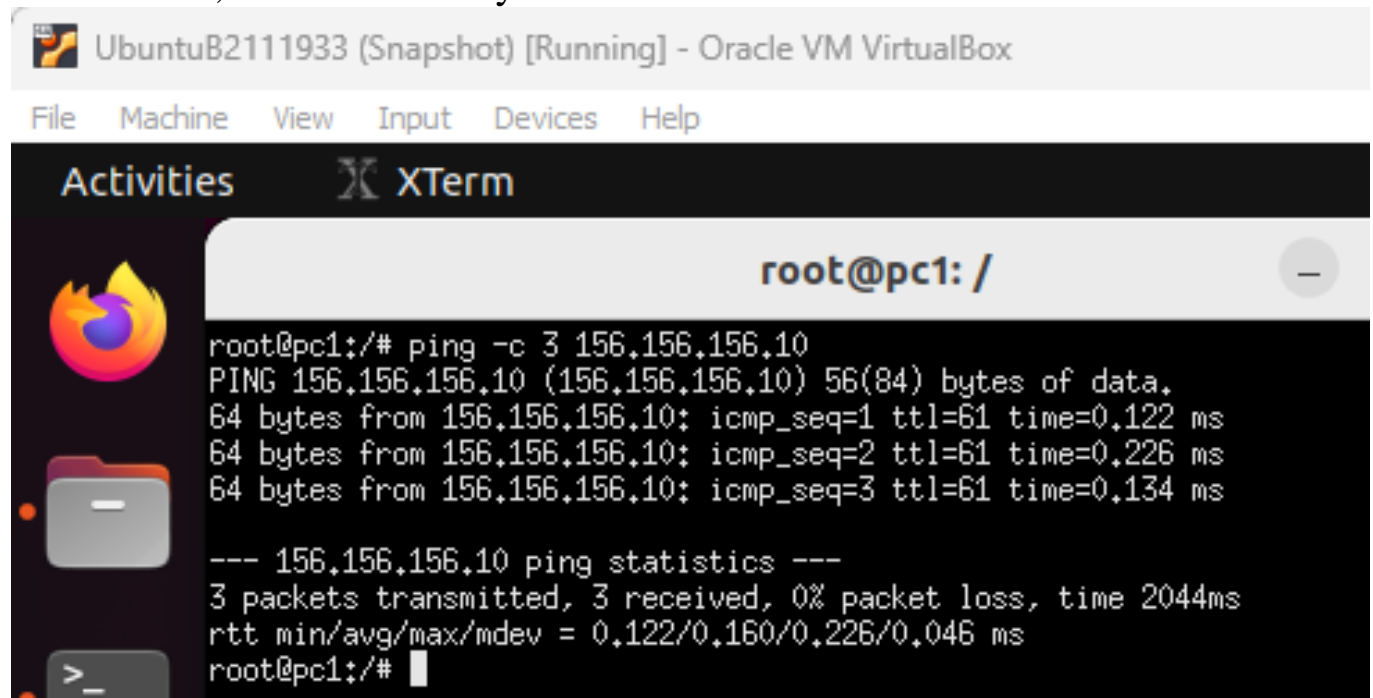
File Machine View Input Devices Help

Activities XTerm

root@server: /

```
root@server:/# /etc/init.d/apache2 start
Starting Apache httpd web server: apache2.
root@server:/#
```


From **client**, test connectivity:



UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

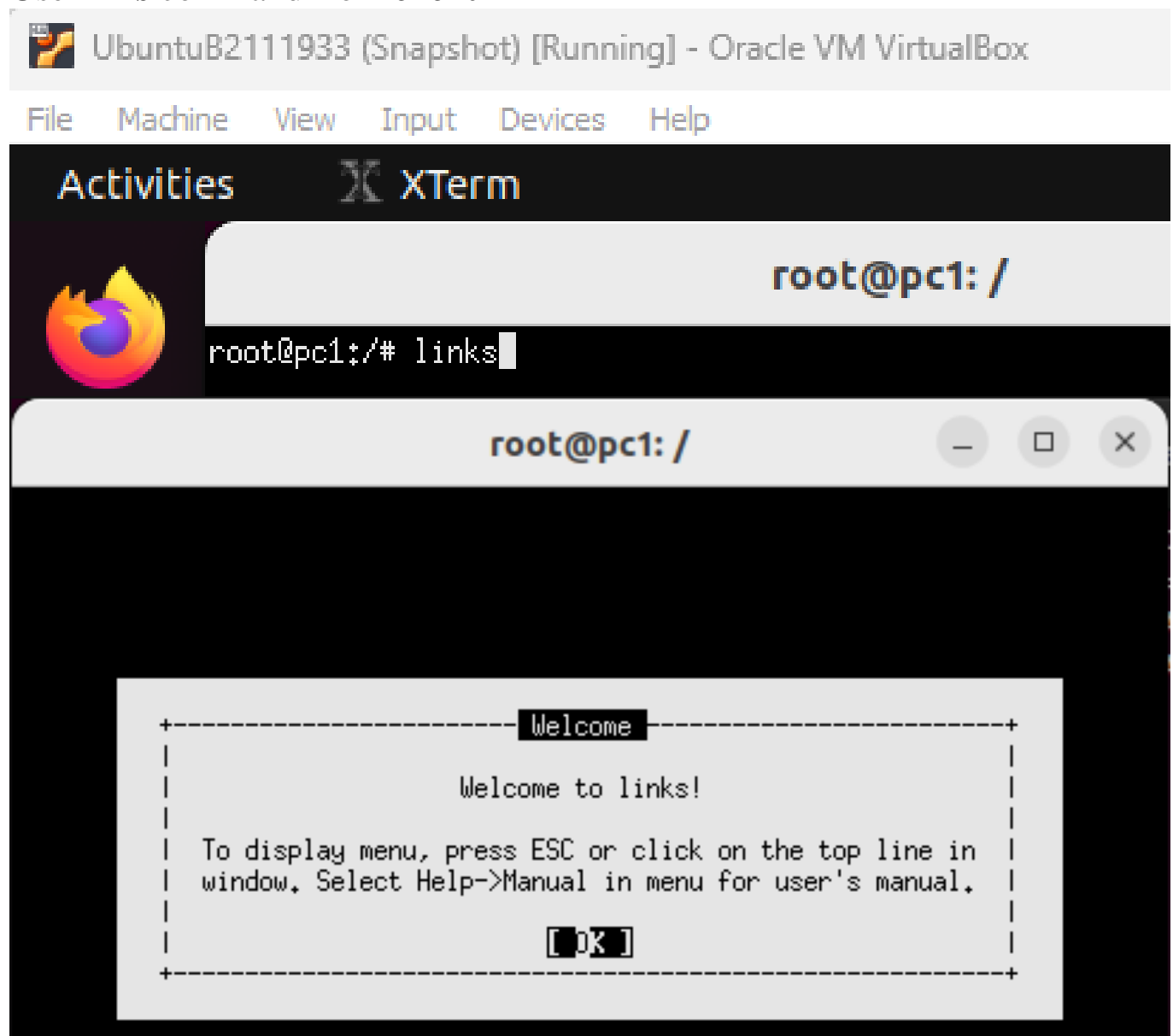
Activities XTerm

root@pc1: /

```
root@pc1:/# ping -c 3 156.156.156.10
PING 156.156.156.10 (156.156.156.10) 56(84) bytes of data.
64 bytes from 156.156.156.10: icmp_seq=1 ttl=61 time=0.122 ms
64 bytes from 156.156.156.10: icmp_seq=2 ttl=61 time=0.226 ms
64 bytes from 156.156.156.10: icmp_seq=3 ttl=61 time=0.134 ms

--- 156.156.156.10 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2044ms
rtt min/avg/max/mdev = 0.122/0.160/0.226/0.046 ms
root@pc1:/#
```

Use **links** command from **client**



UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities XTerm

root@pc1: /

```
root@pc1:/# links
```

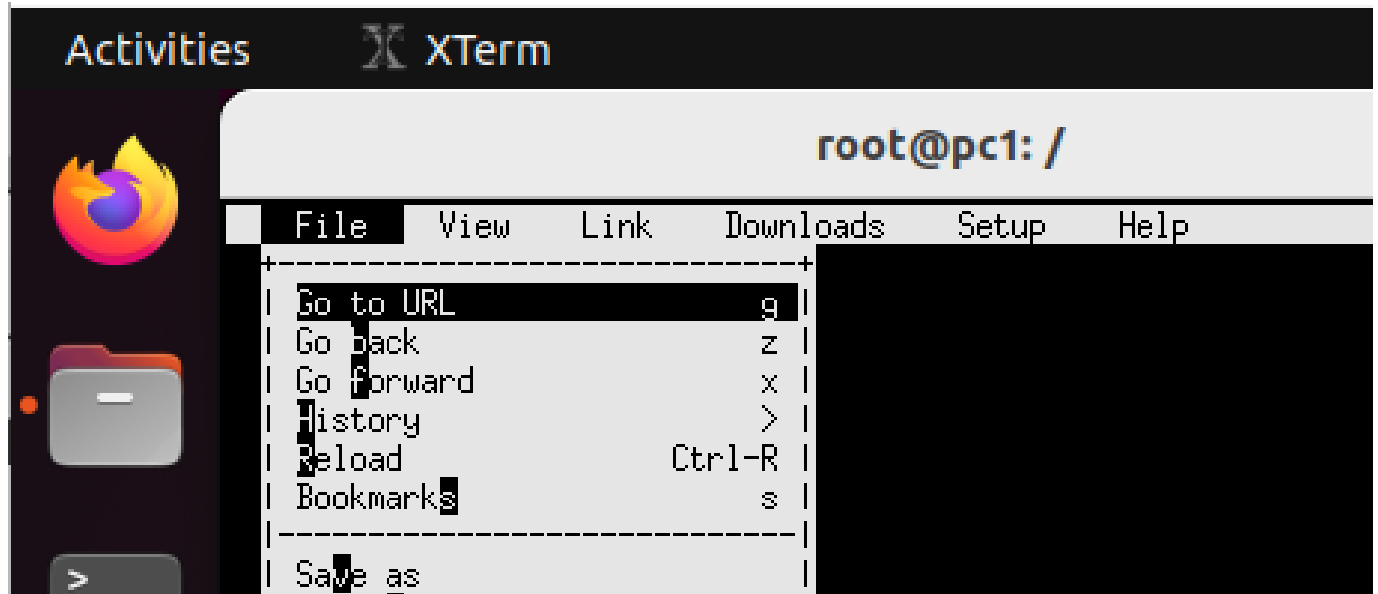
root@pc1: /

```

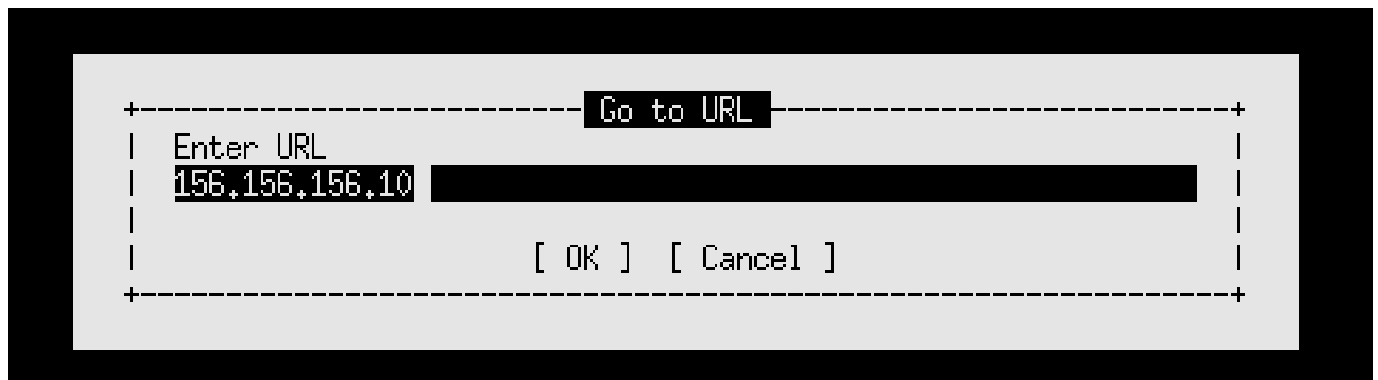
+-----Welcome-----+
|
|      Welcome to links!
|
|  To display menu, press ESC or click on the top line in
|  window. Select Help->Manual in menu for user's manual.
|
|      [ OK ]
|
+-----+

```

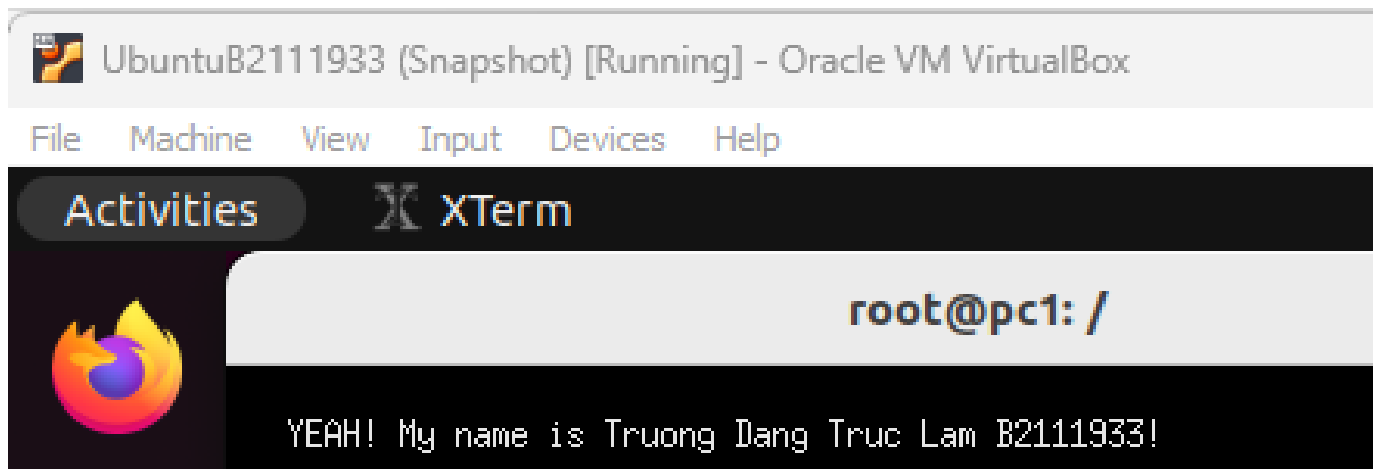
Press **F10**, then select “**Go to URL**”



Enter the **IP Address** of server

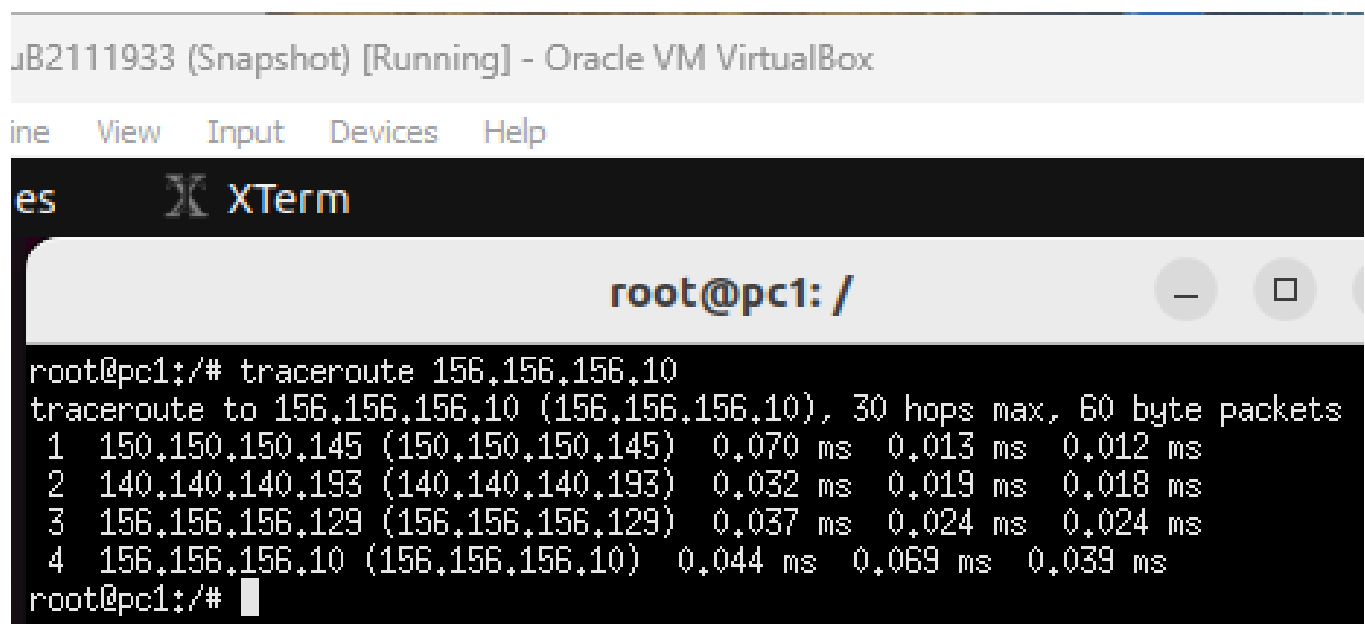


Successful!



6. The command line to check the hops for transmitting data from PC1 to the web server? List all hops between PC1 and the Web server.

The command is **tracert**: The output from **tracert 156.156.156.10** indicates how many servers or hops it takes for transmitting data from **pc1** to the **server**. (from **150.150.150.150** to **156.156.156.10**).



The screenshot shows a terminal window titled "JB2111933 (Snapshot) [Running] - Oracle VM VirtualBox". The terminal is running an XTerm session as root on pc1. The command `tracert 156.156.156.10` has been executed, showing the path from 150.150.150.145 to 156.156.156.10 in 4 hops. The output is as follows:

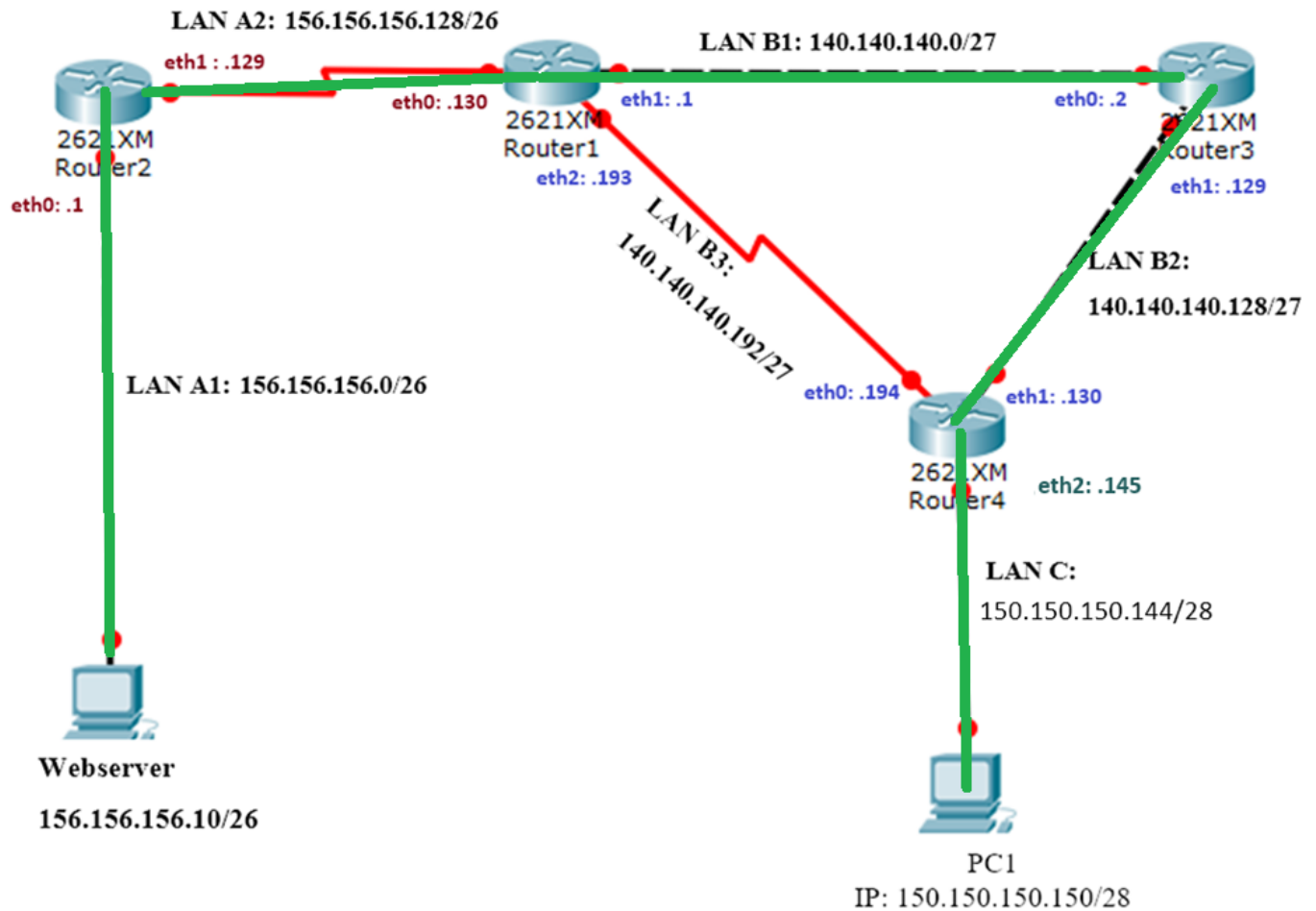
```
root@pc1:/# tracert 156.156.156.10
tracert to 156.156.156.10 (156.156.156.10), 30 hops max, 60 byte packets
 1  150.150.150.145 (150.150.150.145)  0.070 ms  0.013 ms  0.012 ms
 2  140.140.140.193 (140.140.140.193)  0.032 ms  0.019 ms  0.018 ms
 3  156.156.156.129 (156.156.156.129)  0.037 ms  0.024 ms  0.024 ms
 4  156.156.156.10 (156.156.156.10)  0.044 ms  0.069 ms  0.039 ms
root@pc1:/#
```

The destination is **156.156.156.10** and we need **4 hops**:

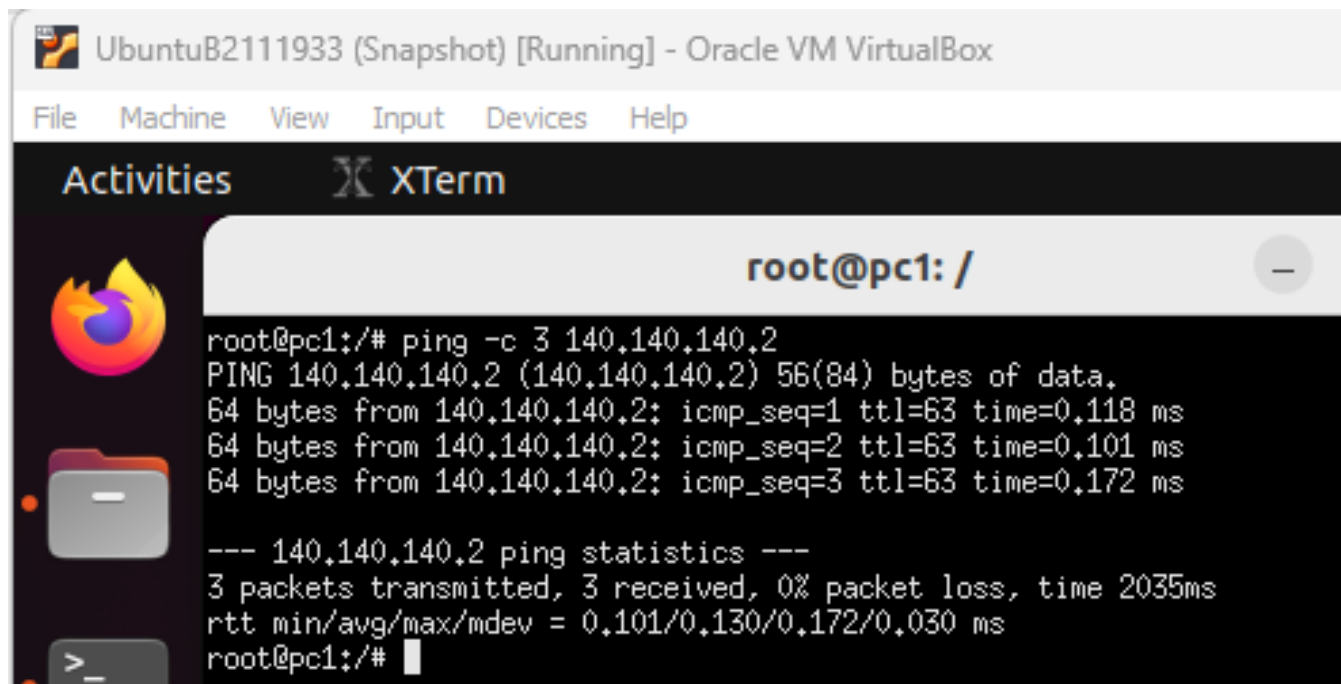
- The first next hop is **150.150.150.145 (r4)**.
- The second is **140.140.140.193 (r1)**.
- The third is **156.156.156.129 (r2)**.
- The fourth (as the last) is **156.156.156.10 (server)**.

7. Check the network system constructed.

This is the only way that we need to check:



Test connectivity on the route from **pc1** to **r3**:



UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

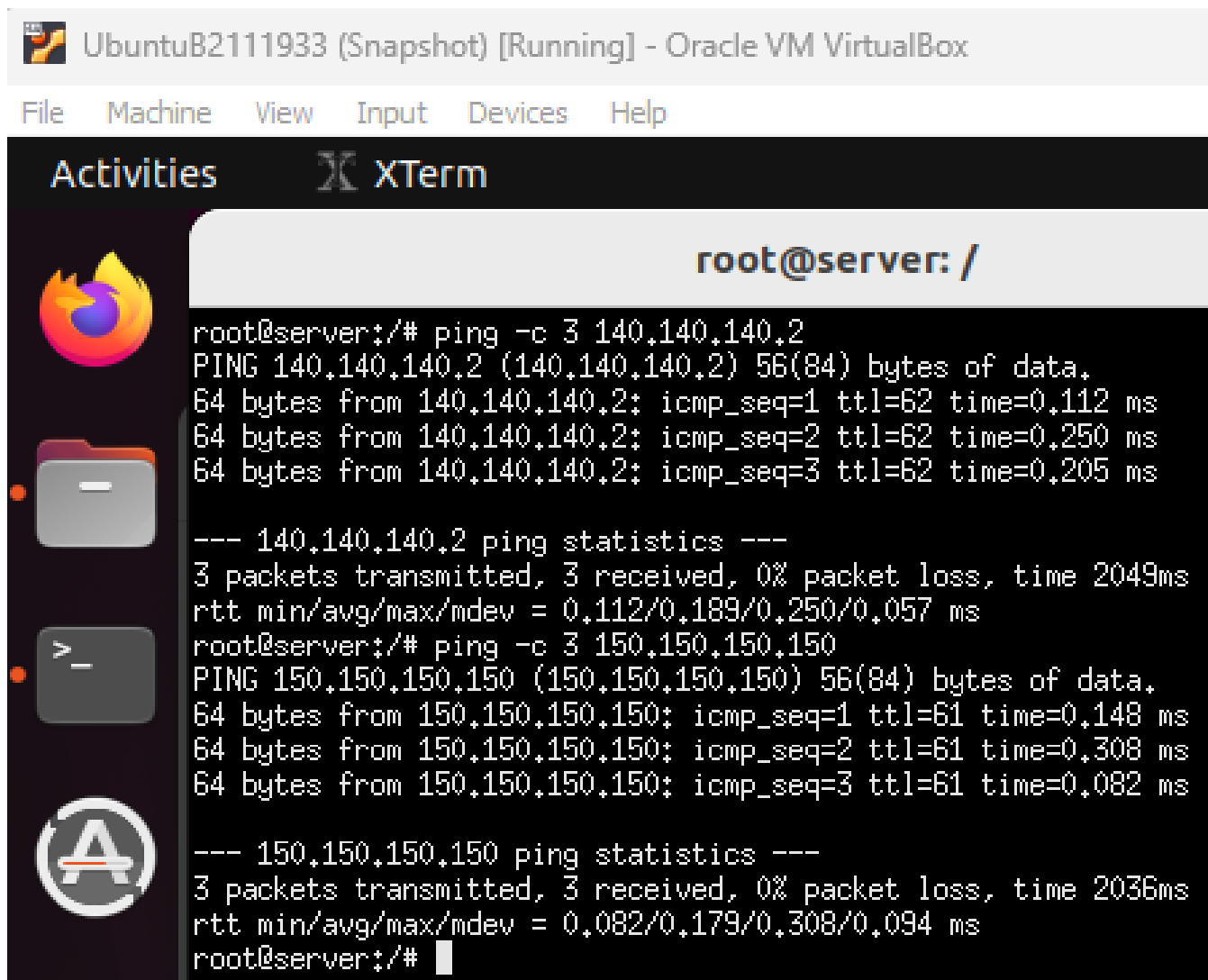
Activities XTerm

root@pc1: /

```
root@pc1:/# ping -c 3 140.140.140.2
PING 140.140.140.2 (140.140.140.2) 56(84) bytes of data.
64 bytes from 140.140.140.2: icmp_seq=1 ttl=63 time=0.118 ms
64 bytes from 140.140.140.2: icmp_seq=2 ttl=63 time=0.101 ms
64 bytes from 140.140.140.2: icmp_seq=3 ttl=63 time=0.172 ms

--- 140.140.140.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2035ms
rtt min/avg/max/mdev = 0.101/0.130/0.172/0.030 ms
root@pc1:/#
```

Test connectivity on the route from **server** to **r3**:



UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities XTerm

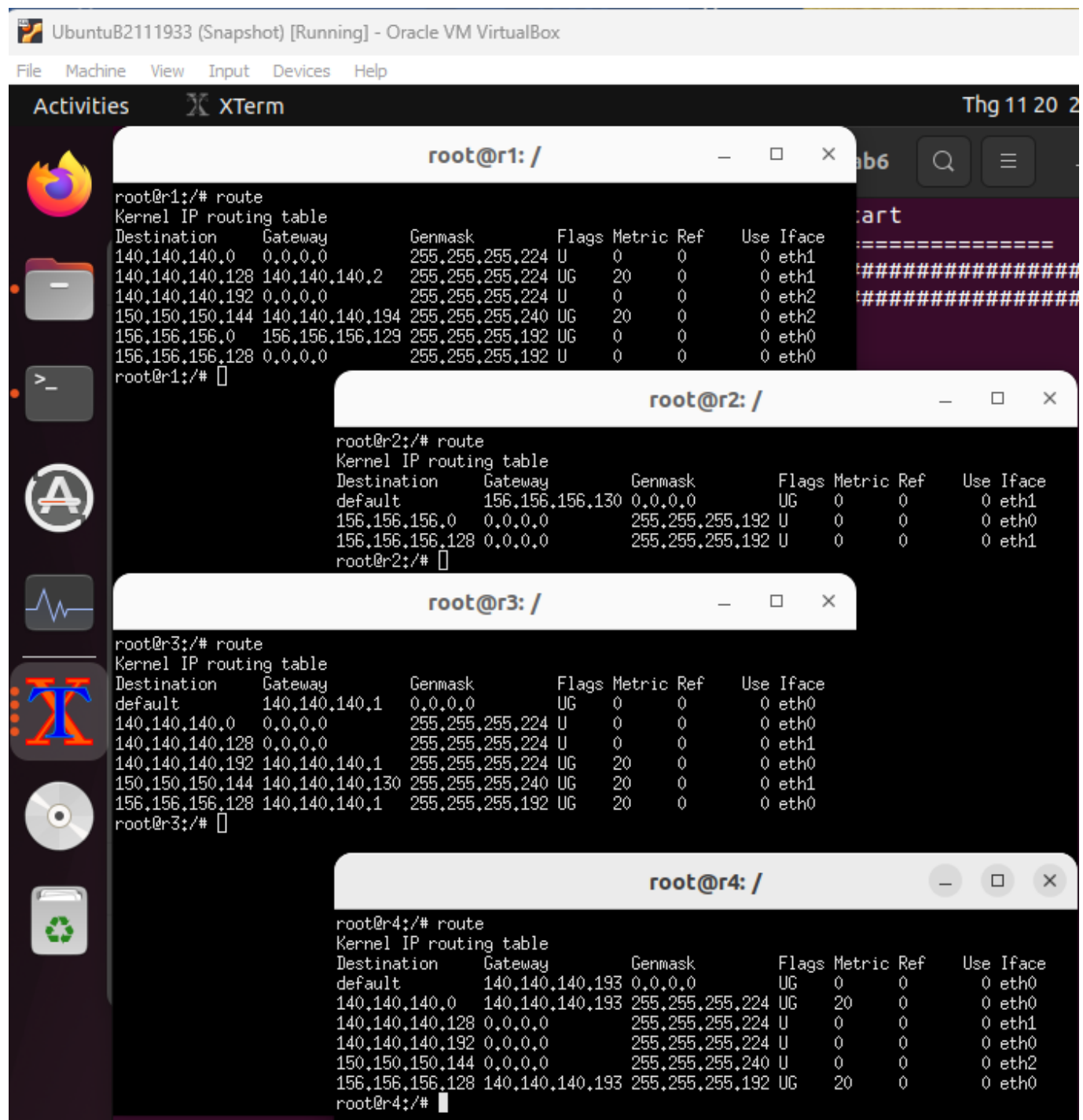
root@server: /

```
root@server:/# ping -c 3 140.140.140.2
PING 140.140.140.2 (140.140.140.2) 56(84) bytes of data.
64 bytes from 140.140.140.2: icmp_seq=1 ttl=62 time=0.112 ms
64 bytes from 140.140.140.2: icmp_seq=2 ttl=62 time=0.250 ms
64 bytes from 140.140.140.2: icmp_seq=3 ttl=62 time=0.205 ms

--- 140.140.140.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2049ms
rtt min/avg/max/mdev = 0.112/0.189/0.250/0.057 ms
root@server:/# ping -c 3 150.150.150.150
PING 150.150.150.150 (150.150.150.150) 56(84) bytes of data.
64 bytes from 150.150.150.150: icmp_seq=1 ttl=61 time=0.148 ms
64 bytes from 150.150.150.150: icmp_seq=2 ttl=61 time=0.308 ms
64 bytes from 150.150.150.150: icmp_seq=3 ttl=61 time=0.082 ms

--- 150.150.150.150 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2036ms
rtt min/avg/max/mdev = 0.082/0.179/0.308/0.094 ms
root@server:/#
```

Listing network routing tables:



The screenshot shows an Ubuntu VM window titled "UbuntuB2111933 (Snapshot) [Running] - Oracle VM VirtualBox". The interface includes a menu bar (File, Machine, View, Input, Devices, Help) and a sidebar with application icons. Four terminal windows are open, each displaying the output of the 'route' command. The windows are titled 'root@r1: /', 'root@r2: /', 'root@r3: /', and 'root@r4: /'. Each terminal shows the 'Kernel IP routing table' with columns for Destination, Gateway, Genmask, Flags, Metric, Ref, Use, and Iface.

```
root@r1: /
root@r1:~# route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
140.140.140.0 0.0.0.0 255.255.255.224 U 0 0 0 eth1
140.140.140.128 140.140.140.2 255.255.255.224 UG 20 0 0 eth1
140.140.140.192 0.0.0.0 255.255.255.224 U 0 0 0 eth2
150.150.150.144 140.140.140.194 255.255.255.240 UG 20 0 0 eth2
156.156.156.0 156.156.156.129 255.255.255.192 UG 0 0 0 eth0
156.156.156.128 0.0.0.0 255.255.255.192 U 0 0 0 eth0
root@r1:~#
```

```
root@r2: /
root@r2:~# route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default 156.156.156.130 0.0.0.0 UG 0 0 0 eth1
156.156.156.0 0.0.0.0 255.255.255.192 U 0 0 0 eth0
156.156.156.128 0.0.0.0 255.255.255.192 U 0 0 0 eth1
root@r2:~#
```

```
root@r3: /
root@r3:~# route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default 140.140.140.1 0.0.0.0 UG 0 0 0 eth0
140.140.140.0 0.0.0.0 255.255.255.224 U 0 0 0 eth0
140.140.140.128 0.0.0.0 255.255.255.224 U 0 0 0 eth1
140.140.140.192 140.140.140.1 255.255.255.224 UG 20 0 0 eth0
150.150.150.144 140.140.140.130 255.255.255.240 UG 20 0 0 eth1
156.156.156.128 140.140.140.1 255.255.255.192 UG 20 0 0 eth0
root@r3:~#
```

```
root@r4: /
root@r4:~# route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default 140.140.140.193 0.0.0.0 UG 0 0 0 eth0
140.140.140.0 140.140.140.193 255.255.255.224 UG 20 0 0 eth0
140.140.140.128 0.0.0.0 255.255.255.224 U 0 0 0 eth1
140.140.140.192 0.0.0.0 255.255.255.224 U 0 0 0 eth0
150.150.150.144 0.0.0.0 255.255.255.240 U 0 0 0 eth2
156.156.156.128 140.140.140.193 255.255.255.192 UG 20 0 0 eth0
root@r4:~#
```

The End